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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	: Tomas I. Babic et al.	Art Unit	: 2835
Serial No.	: 10/716,543	Examiner	: Corey M. Broussard
Filed	: November 20, 2003		
Title	: MECHANICAL REINFORCEMENT STRUCTURE FOR FUSES		

Mail Stop Appeal Brief - Patents
Commissioner for Patents
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BRIEF ON APPEAL

(1) Real Party in Interest

Cooper Technologies Company, the assignee of this application, is the real party in interest.

(2) Related Appeals and Interferences

There are no related appeals or interferences.

(3) Status of Claims

Claims 1-7 and 9-39 are pending in this application, with claims 1, 25 and 38 being independent. Claim 8 has been canceled.

(4) Status of Amendments

The claims have not been amended subsequent to the final rejection dated April 19, 2005.

(5) Summary of Claimed Subject Matter

Rejected independent claims 1 and 38 are directed to fuses that each include an electrical assembly and a fuse tube assembly. The electrical assembly includes two electrical contacts accessible from an exterior of a fuse and a fuse element in contact with the two electrical contacts. The fuse tube assembly includes a pre-formed tubular support structure surrounding at least a portion of the electrical assembly and a reinforcing structure formed over the pre-formed tubular support structure and in contact with at least a portion of the electrical assembly. The

reinforcing structure includes a fiber matrix pre-impregnated with a resin (claim 1) or a resin composition of discontinuous fibers arbitrarily dispersed in an epoxy (claim 38).

Rejected independent claim 25 is directed to a method of reinforcing a fuse. The method includes providing an electrical assembly that includes two electrical contacts accessible from an exterior of a fuse and a fuse element in contact with the two electrical contacts. At least a portion of the electrical assembly is surrounded by a pre-formed tubular support structure, and a reinforcing structure is applied over the pre-formed tubular support structure. The reinforcing structure includes a fiber matrix having fibers pre-impregnated with a resin.

As shown in Figs. 1 and 2, and set forth at page 5, line16 to page 6, line 3 of the application, an implementation of a fuse 100 may include an electrical contact/fuse element assembly 105 and a fuse tube assembly 120. The electrical contact/fuse element assembly 105 includes electrical contacts 110 and a fuse element 115. An electrical contact 110 is provided at each end of the fuse 100 and the fuse element 115 is connected between the two electrical contacts 110. The fuse element 115 is contained in a fuse tube assembly 120 that includes a support structure 125 and a reinforcing structure 130. The support structure 125 surrounds a portion the electrical contact/fuse element assembly 105 and provides a mechanical structure on which the reinforcing structure 130 may be applied. A portion of the inside surface of the support structure 125 overlaps a portion of an outside surface of the electrical assembly 105, such as an outside portion of the electrical contact 110.

Use of the support structure 125 prevents the reinforcing structure from collapsing before being hardened in a curing operation. The reinforcing structure 130 is formed over the support structure 125 and is in direct physical contact with a portion of the electrical assembly 105, such as an outside surface of an electrical contact 110. Because the support structure 125 is merely providing a mechanical support around which the reinforcing structure 130 is applied, the support structure 125 may be relatively thin and need not have any additional preparation, such as a centerless ground surface to receive the electrical contacts 110." Application at page 6, lines 6-13.

(6) Grounds of Rejection

Claims 1-4, 6-11, 14, 16, 17, 22-25, 27-29, 31-33, 37-39 have been rejected as being anticipated by U.S. Patent No. 3,979,709 ("Healey"). Dependent claim 5 has been rejected as obvious over Healey in view of U.S. Patent No. 4,349,803 ("Tobin"). Claims 12, 13, and 26 have been rejected as obvious over Healey in view of U.S. Patent No. 4,028,656 ("Schmunk"). Claim 15 has been rejected as obvious over Healey in view of Schmunk and in further view of U.S. Patent No. 5,261,980 ("Pearce"). Claims 18-21, 30, and 34-36 have been rejected as obvious over Healey.

(7) Argument

Claims 1-4, 6-11, 14, 16, 17, 22-25, 27-29, 31-33, 37-39 have been rejected as being anticipated by Healey.

With respect to claims 1 and 38, and their dependent claims, appellant requests reversal of this rejection because Healey does not disclose, for example, a pre-formed tubular support structure and a reinforcing structure formed over the pre-formed tubular support structure.

Healey relates to an electric fuse having a laminated casing 6 formed of multiple layers of resin-impregnated glass cloth. See Abstract. In particular, three plies 6a, 6b, and 6c, of a woven glass fiber fabric material are sandwiched together and then impregnated with a thermosetting resin to integrate the three plies into a single tubular laminate to form the case. See column 6, line 22 to column 8, line 19. The casing is formed by a pultrusion process in which all layers of the laminate are folded on a mandrel and then infused with resin. See FIG. 15 and col. 11:33 - col. 12:39. Thus, all layers of the laminated casing are formed and integrated together, see col. 6:27-29 ("Casing 6 further includes a thermosetting resin integrating plies 6a, 6b, 6c into a tubular laminate."), and thus Healey does not disclose a pre-formed tubular support structure over which a fiber matrix reinforcing structure is formed.

The final action asserts that plies 6a and 6b are identical to the claimed preformed tubular support structure and that ply 6c is identical to the claimed reinforcing structure. Office action at page 2. However, plies 6a and 6b are not a preformed tubular support structure. This is particularly evident because, for the plies 6a, 6b, and 6c, to be formed into a casing, they must be laid over an inner mandrel D2 of a die that is used to define the shape of the casing. However,

the plies 6a and 6b by themselves do not form a tubular support structure until after they have been integrated with ply 6c and cured. Thus, even when plies 6a, 6b, and 6c have been formed into a rigid structure, there is no pre-formed tubular support structure over which a fiber matrix reinforcing structure is formed. Rather, there is only a single structure in which the plies 6a, 6b, and 6c are integrated.

The final action asserts that the recitation in claim 1 that the tubular support structure is pre-formed holds no patentable weight because the pre-formed nature of the support structure allegedly relates only to the process by which the structure is made and not its structure. However, such arguments by the Office to deny patentability have long ago been rejected by the courts. For example, in In re Garnero, 412 F.3d 276 (CCPA 1969), an inventor sought a patent for a thermal insulation panel formed from expanded perlite particles. The inventor claimed "a thermal insulation panel . . . consisting essentially of expanded perlite particles which are interbonded one to another by interfusion between the surfaces of the perlite particles while in a pyroplastic state to form a porous perlite panel." Id. at 277. The Office rejected the claim because it read the language "expanded perlite particles which are interbonded one to another by interfusion" as reciting a mere process limitation. Id. at 278-79. The CCPA rejected this argument and held that the disputed language recited a structural limitation. The Court noted that this language was similar to other language that had been held to be structural, such as, "intermixed," "ground in place," "press fitted," "etched," and "welded." Id. at 279.

Here, the claim language, "pre-formed tubular support structure," is structural in the same sense that the claim language in Garnero was held to be structural. In particular, the language of claims 1 and 38 requires a preformed tubular support structure, which distinguishes the subject matter of claims 1 and 38 structurally from the apparatus disclosed in Healey. Whereas in Healay, a die is required to form the three plies 6a, 6b, and 6c into a single casing, claims 1 and 38 require that a reinforcing structure is formed over a separate preformed tubular support structure. Thus, in one implementation, "the support structure 125 prevents the reinforcing structure 130 from collapsing before being hardened in a curing operation. The reinforcing structure 130 is formed over the support structure 125 and is in direct physical contact with a portion of the electrical assembly 105, such as an outside surface of an electrical contact 110. Because the support structure 125 is merely providing a mechanical support around which the

reinforcing structure 130 is applied, the support structure 125 may be relatively thin and need not have any additional preparation, such as a centerless ground surface to receive the electrical contacts 110." Application at pages 5 - 6.

The Office relies on In re Thorpe, 777 F.2d 695 (Fed. Cir. 1995) to support its rejection; however, Thorpe is inapposite. The invention at issue in Thorpe related to color developers used in carbonless copy paper systems. Thorpe discovered a novel process for making the color developer, and the Office allowed Thorpe's claims to the novel process. However, Thorpe also sought product-by-process claims, such as "44. The product of the process of Claim 1." id. at 696, and the Office rejected these claims. The Federal Circuit upheld the rejection because the Office established a prima facie case of unpatentability and because Thorpe did "not assert that the product of his process is different from the product of the prior art."

Independent claims 1 and 38 of the present application, however, do not claim a product-by-process, and the appellant does assert that his product is structurally different from the prior art. Therefore, Thorpe's holding is not pertinent to the question of the patentability of the present claims. Rather, according to the controlling authority of Garnero, the "pre-formed tubular support structure" language in claims 1 and 38 is structural, and this language distinguishes claims 1 and 38 from Healey.

In the advisory action, the Examiner takes a somewhat different position with respect to Healey. In particular, the advisory action asserts:

> Healey does in fact teach a pre-formed structure (the reinforced casing 6 is formed prior to the final product fuse taught). The "pre-formed" limitation merely states that the structure was formed preceding some other event. This does not explicitly or implicitly claim a structural limitation unanticipated by Healey.

This position ignores the fact that each of claims 1 and 38 recites that the reinforcing structure is formed over the pre-formed tubular support structure, such that the pre-formed tubular support structure must be formed before the reinforcing structure is formed (i.e., formation of the reinforcing structure is the "other event" identified by the examiner). As has been discussed above, this simply does not occur in Healey. Moreover, if the reinforced casing 6 of Healey were said to correspond to the pre-formed tubular support structure, there would be nothing in Healey that could be said to correspond to the reinforcing structure recited in the claims.

For at least these reasons, appellant requests reversal of the rejections of claims 1 and 38. Claims 2-4, 6-11, 14, 16, 17, and 22-24 depend from claim 1 and are allowable for at least the reasons that claim 1 is allowable. Claim 39 depends from claim 38 and is allowable for at least the same reasons that claim 38 is allowable.

Independent claim 25 recites a method of reinforcing a fuse, including providing an electrical assembly that includes two electrical contacts accessible from an exterior of a fuse and a fuse element in contact with the two electrical contacts, surrounding at least a portion of the electrical assembly by a pre-formed tubular support structure, and applying a reinforcing structure over the pre-formed tubular support structure and in contact with at least a portion of the electrical assembly, where the reinforcing structure comprises a fiber matrix, the fiber matrix comprising fibers pre-impregnated with a resin.

As explained above, Healey does not disclose applying a reinforcing structure over a pre-formed tubular support structure. Rather, Healey discloses, in FIG. 15 and at col. 11:33 – col. 12:39, pultruding a multilayer laminate and infusing the laminate with resin to form a fuse casing. Thus, Healey discloses neither a pre-formed tubular support structure nor applying a reinforcing structure over the pre-formed tubular support structure. For at least this reason, appellant requests reversal of the rejection of claim 25. Claims 27-29, 31-33, and 37 depend from claim 25 and are allowable for at least the reasons that claim 25 is allowable.

Dependent claim 5 has been rejected as being obvious over Healey in view of Tobin. Appellant requests reversal of this rejection because Tobin does not cure the deficiencies of Healey.

Tobin relates to a weather resistant fuse tube having an inner portion, an outer portion, and a reinforcing material (e.g., fiberglass cloth, mat, or spirally wound strands). See col. 4:1-9. To make the fuse tube, a cylinder of reinforcing material is placed in a mold, and material is introduced into the mold from inside the cylinder to form the inner portion of the tube and from outside the cylinder to form the outer portion of the tube. Material from inside and from outside the reinforcing material cylinder flows through the reinforcing material so that material inside the cylinder bonds with material outside the cylinder, such that the inner portion and outer portion bond together to form a continuum. See col. 4:24-35; see also col. 3:2-10.

Thus, Tobin does not disclose a pre-formed tubular support structure over which a reinforcing structure is formed, as recited in claims 1 and 38, and Tobin does not disclose applying a reinforcing structure over a pre-formed tubular support structure, as recited in claim 25. Rather, Tobin discloses injecting fluid material into a mold containing a reinforcing material, such that a tube is molded that includes the reinforcing material within the molded tube.

Accordingly, Tobin does not cure the deficiencies of Healey with respect to independent claim 1. Because claim 5 depends from claim 1, claim 5 is allowable for at least the reasons that claim 1 is allowable.

Claims 12, 13, and 26 have been rejected as obvious over Healey in view of Schmunk. Appellant requests reversal of this rejection because Schmunk does not cure the deficiencies of Healey.

Schmunk relates to a high-voltage fuse with an out heat-shrinkable sleeve. See Abstract. However, Schmunk does not describe a fuse tube assembly that includes a pre-formed tubular support structure and a reinforcing structure formed over the pre-formed tubular support structure and in contact with at least a portion of the electrical assembly.

Thus, Schmunk does not cure the deficiencies of Healey with respect to independent claim 1. Because claims 12, 13, and 26 depend from claim 1, claims 12, 13, and 26 are allowable for at least the reasons that claim 1 is allowable.

Claim 15 has been rejected as obvious over Healey in view of Schmunk and in further view of Pearce. Appellant requests reversal of this rejection because Pearce does not cure the deficiencies of Healey and Schmunk.

Pearce relates to a method of manufacturing fiber-reinforced composite materials (e.g., for use as ski poles, spars for hang gliders, rocket launch tubes, etc.) Col. 1: 6-17. However, Pearce does not describe a fuse tube assembly that includes a pre-formed tubular support structure and a reinforcing structure formed over the pre-formed tubular support structure and in contact with at least a portion of the electrical assembly.

Thus, Pearce does not cure the deficiencies of Healey and Schmunk with respect to independent claim 1. Because claim 15 depends from claim 1, claim 15 is allowable for at least the reasons that claim 1 is allowable.

Claims 18-21, 30, and 34-36 have been rejected as allegedly obvious over Healey. Appellant requests reversal of this rejection and allowance of dependent claims 18-21, 30, and 34-36 because, as explained above, Healey does not describe or suggest all of the elements of independent claims 1 and 25, from which these claims depend.

Appellant submits that all claims are in condition for allowance.

A check for $620 covering the brief fee ($500) and the one month extension of time fee ($120) is enclosed. Please apply any other charges or credits to Deposit Account No. 06-1050.

Respectfully submitted,

Date: 11/24/05

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Appendix of Claims

1. (Previously Presented) A fuse comprising:

an electrical assembly comprising two electrical contacts accessible from an exterior of a fuse and a fuse element in contact with the two electrical contacts; and

a fuse tube assembly comprising a pre-formed tubular support structure surrounding at least a portion of the electrical assembly and a reinforcing structure formed over the pre-formed tubular support structure and in contact with at least a portion of the electrical assembly, wherein the reinforcing structure comprises a fiber matrix pre-impregnated with a resin.

2. (Original) The fuse of claim 1 wherein the fuse comprises a current limiting fuse.

3. (Original) The fuse of claim 1 wherein the fuse element extends between the contacts.

4. (Original) The fuse of claim 1 wherein the fuse tube assembly extends between the contacts.

5. (Previously Presented) The fuse of claim 1 wherein an inside surface of the pre-formed tubular support structure overlaps a portion of an outside surface of each of the electrical contacts.

6. (Original) The fuse of claim 1 wherein the fiber matrix comprises a pre-woven fabric.

7. (Original) The fuse of claim 6 wherein the fibers in the pre-woven fabric are oriented in a predetermined orientation.

8. (Cancelled)

9. (Previously Presented) The fuse of claim 1 wherein the pre-formed tubular structure comprises a composite material.

10. (Previously Presented) The fuse of claim 1 wherein the pre-formed tubular structure has a slit extending from a first end of the structure to a second end of the structure.

11. (Previously Presented) The fuse of claim 1 wherein a thickness of the pre-formed tubular support structure is greater than a thickness of the reinforcing structure.

12. (Original) The fuse of claim 1 wherein the fuse tube assembly further comprises a heat shrink structure formed over the reinforcing structure.

13. (Original) The fuse of claim 12 wherein the heat shrink structure is constructed of a material providing UV protection.

14. (Original) The fuse of claim 12 wherein the heat shrink structure comprises a pre-formed sleeve.

15. (Original) The fuse of claim 12 wherein the heat shrink structure comprises one or more strips of a heat shrink tape.

16. (Original) The fuse of claim 1 wherein the fiber matrix is applied circumferentially.

17. (Original) The fuse of claim 16 wherein the fiber matrix is applied circumferentially such that the fibers have a predetermined orientation at a predetermined angle with respect to an axis of the fuse.

18. (Original) The fuse of claim 1 wherein the fiber matrix is applied vertically.

19. (Original) The fuse of claim 18 wherein the vertical application comprises at least one piece of fiber matrix placed in a vertical orientation along an axis of the fuse.

20. (Original) The fuse of claim 18 wherein the vertical application comprises a single piece of fiber matrix placed in a vertical orientation along an axis of the fuse and having a sufficient width to cover the majority of an outer surface of the fuse.

21. (Original) The fuse of claim 1 wherein the reinforcing structure further comprises at least one layer of pre-impregnated fiber matrix applied circumferentially and at least one layer of pre-impregnated fiber matrix applied vertically.

22. (Original) The fuse of claim 1 wherein the reinforcing structure is configured to reinforce a selected portion of an area of the fuse along a lengthwise axis of the fuse.

23. (Original) The fuse of claim 22 wherein the selected portion of the area comprises less than all of the area.

24. (Original) The fuse of claim 22 wherein the selected portion of the area comprises an area excluding a portion of the outside surface of the electrical assembly.

25. (Previously Presented) A method of reinforcing a fuse, the method comprising:

providing an electrical assembly, the electrical assembly comprising two electrical contacts accessible from an exterior of a fuse and a fuse element in contact with the two electrical contacts;

surrounding at least a portion of the electrical assembly by a pre-formed tubular support structure;

applying a reinforcing structure over the pre-formed tubular support structure and in contact with at least a portion of the electrical assembly, wherein the reinforcing structure comprises a fiber matrix, the fiber matrix comprising fibers pre-impregnated with a resin.

26. (Original) The method of claim 25 further comprising applying a heat shrink structure over the reinforcing structure.

27. (Original) The method of claim 25 wherein applying the reinforcing structure comprises applying the pre-impregnated fiber matrix in a rolling operation.

28. (Original) The method of claim 25 wherein applying the reinforcing structure comprises applying the pre-impregnated fiber matrix in a wrapping operation.

29. (Original) The method of claim 25 wherein applying the reinforcing layer comprises circumferentially applying the pre-impregnated fiber matrix.

30. (Original) The method of claim 25 wherein applying the reinforcing layer comprises vertically applying the pre-impregnated fiber matrix.

31. (Original) The method of claim 25 further comprising performing post application processing of the fuse.

32. (Original) The method of claim 31 wherein performing post application processing comprises curing.

33. (Original) The method of claim 32 wherein curing the reinforcing fuse comprises heating the fuse.

34. (Original) The method of claim 33 wherein the fuse is heated to between approximately 250° F and 400° F.

35. (Original) The method of claim 25 further comprising pre-heating the electrical assembly.

36. (Original) The method of claim 35 wherein the electrical assembly is pre-heated to between approximately 100° F and 200° F.

37. (Original) The method of claim 25 further comprising filling the fuse with an electrical arc quenching medium.

38. (Previously Presented) A fuse comprising:

an electrical assembly comprising two electrical contacts accessible from an exterior of the fuse and a fuse element in contact with the two electrical contacts; and

a fuse tube assembly comprising a pre-formed tubular support structure surrounding at least a portion of the electrical assembly and a reinforcing structure formed over the pre-formed tubular support structure;

wherein the reinforcing structure comprises a resin composition of discontinuous fibers arbitrarily dispersed in an epoxy.

39. (Original) The fuse of claim 38 wherein the fuse comprises a current limiting fuse.

Appendix of Evidence

Appendix of Related Proceedings